

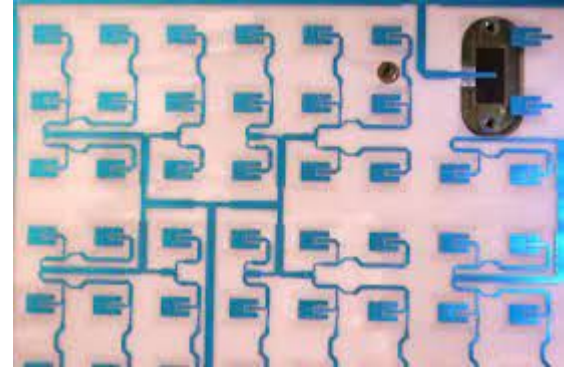
Antenna and Microwave Communication

Lecture 1

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What is an antenna?

An Antenna, is an electrical device that converts electric power into electromagnetic waves (or simply radio waves) and vice-versa



Used for Wireless Communication

Antenna wave transmission



Figure 3: Block diagram of a radio link

Antenna functionality

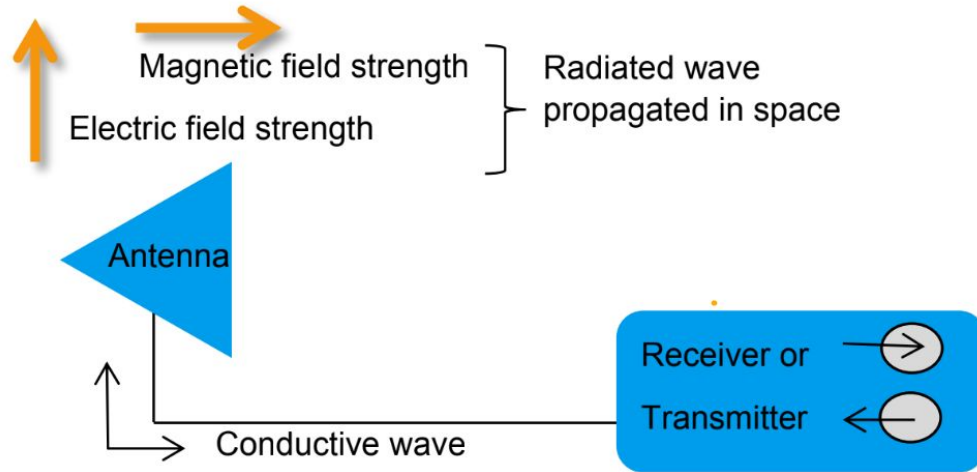
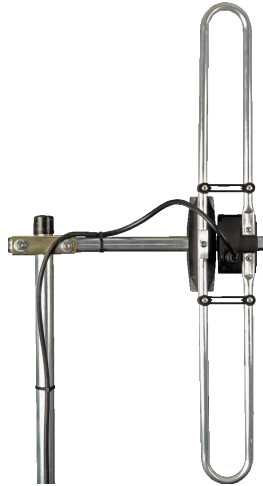


Figure 1: Basic antenna functionality

Types of antennas

Wire Antennas



Dipole antennas



Loop antennas



Helix antennas

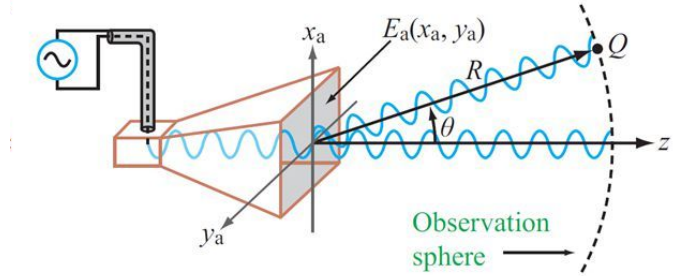


Types of antennas

Aperture antennas



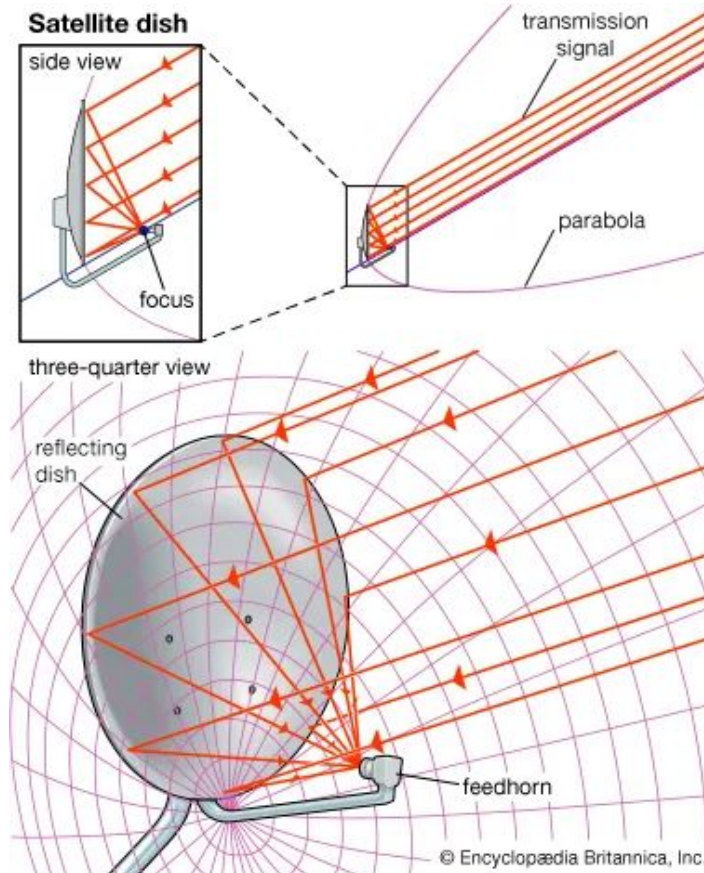
Horn antennas



Types of antennas

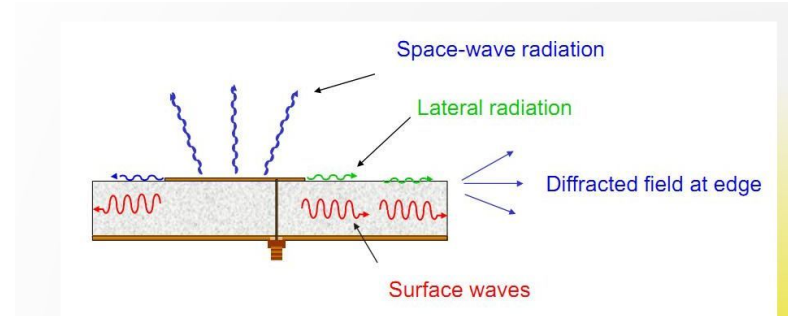
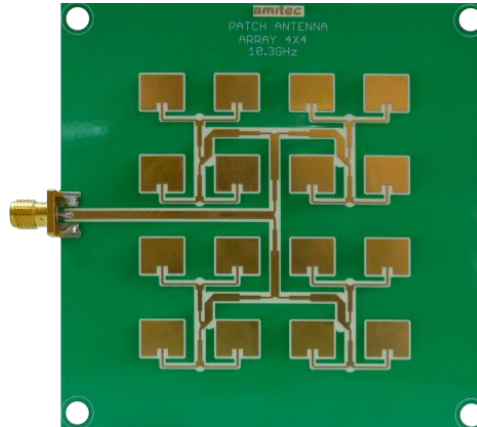
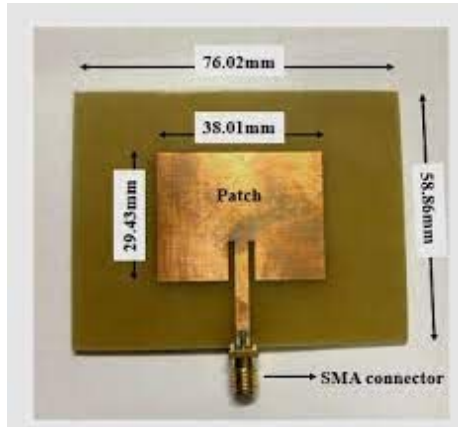
Aperture antennas

Parabolic reflector antennas

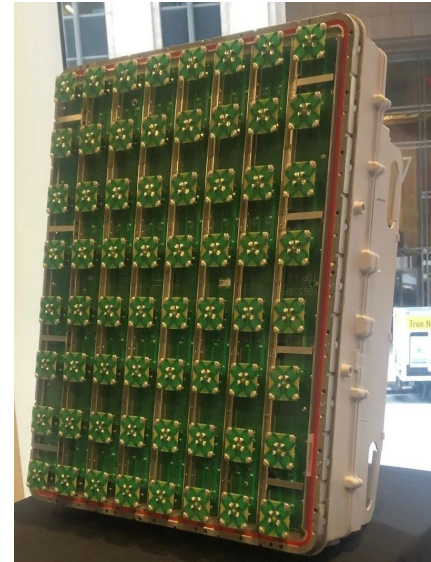
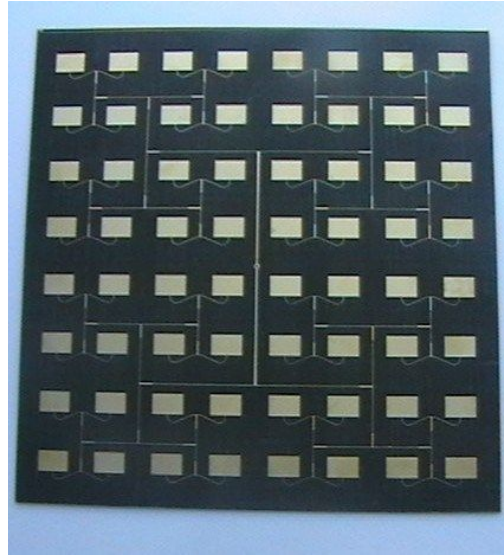


Types of antennas

Microstrip antennas



Array antennas



Fundamental Parameters of Antennas (Characteristics)

- Antenna Radiation Pattern
- Radiation Intensity
- Directivity and Gain
- Radiation Efficiency and Power Gain
- Input Impedance
- Effective Length
- Bandwidth
- Effective Aperture
- Antenna Polarization

Solving real world problems with antennas

Interactive session

Scenario	Suitable Antenna Type	Why?	Proof from Research Works

Ansys HFSS

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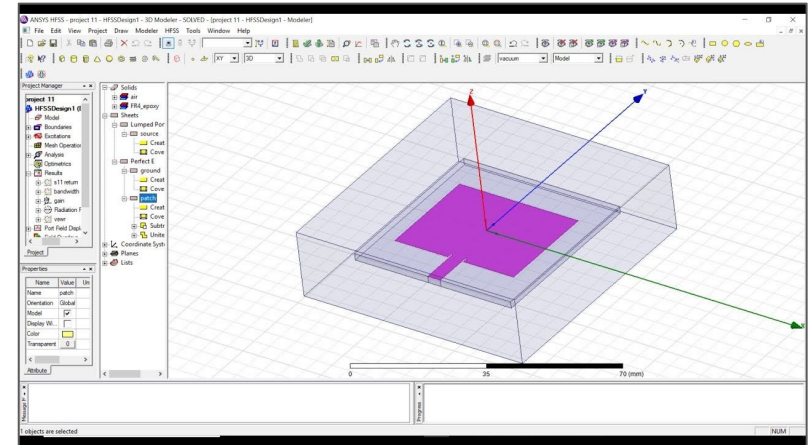
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Antenna and Microwave Communication

Lecture 2

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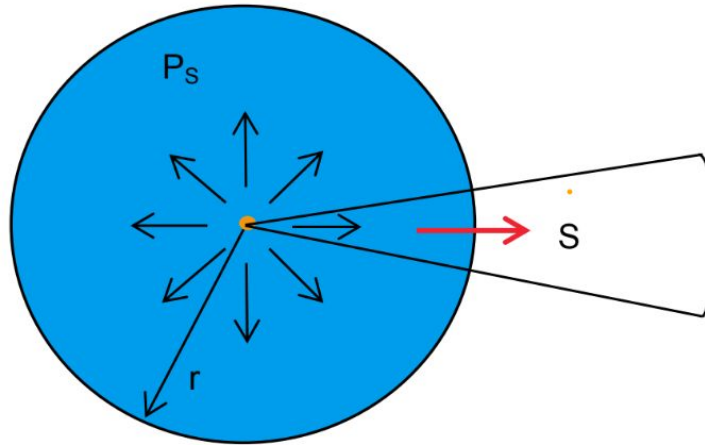


Figure 8: The isotropic radiator in homogenous space

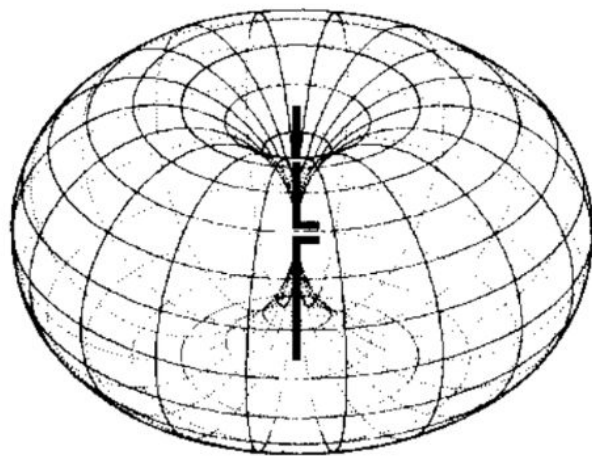


Figure 9: Three-dimensional radiation of a dipole antenna

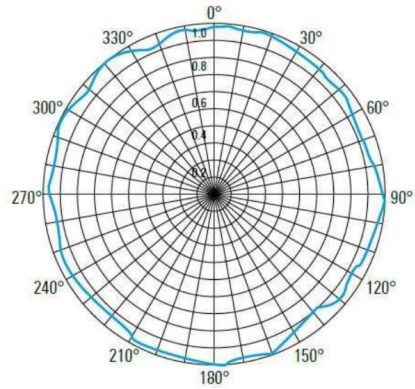


Figure 11: Horizontal pattern of a dipole antenna

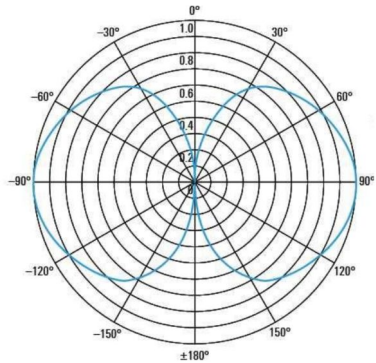


Figure 12: Vertical pattern of a dipole antenna

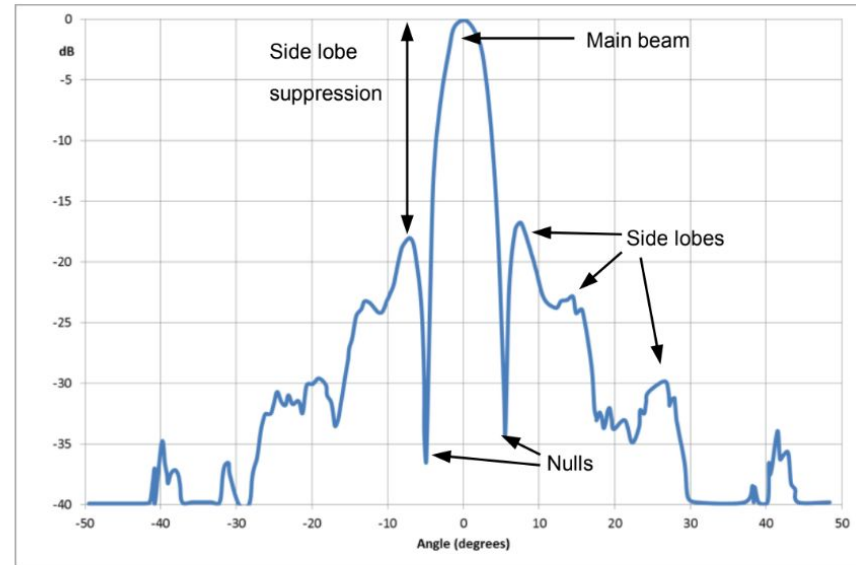


Figure 13: Radiation pattern in Cartesian coordinates

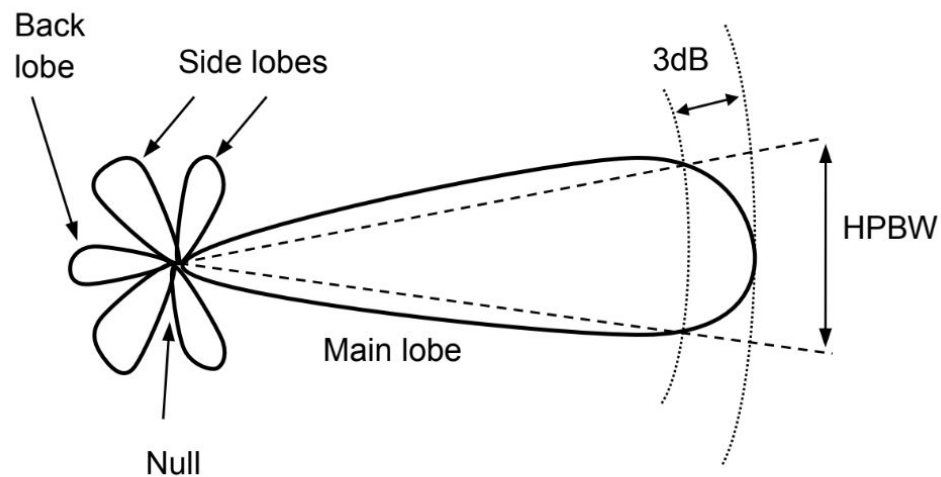


Figure 14: Further parameters in the radiation pattern

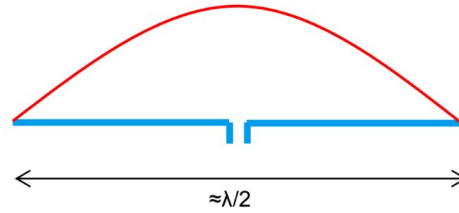
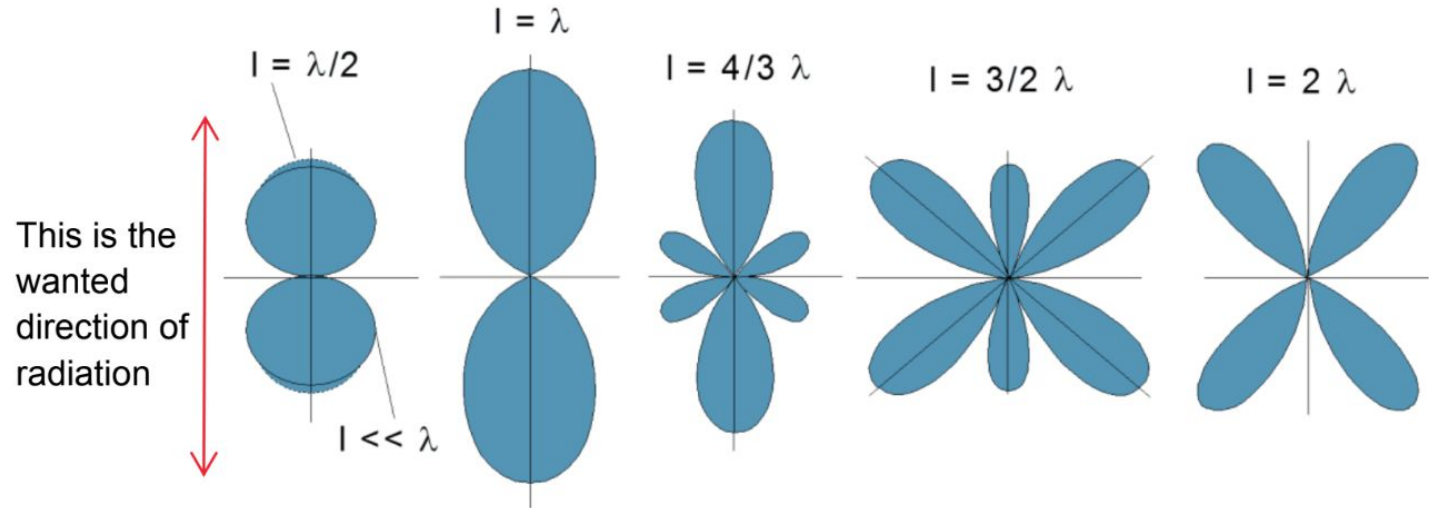


Figure 17: Half-wave dipole



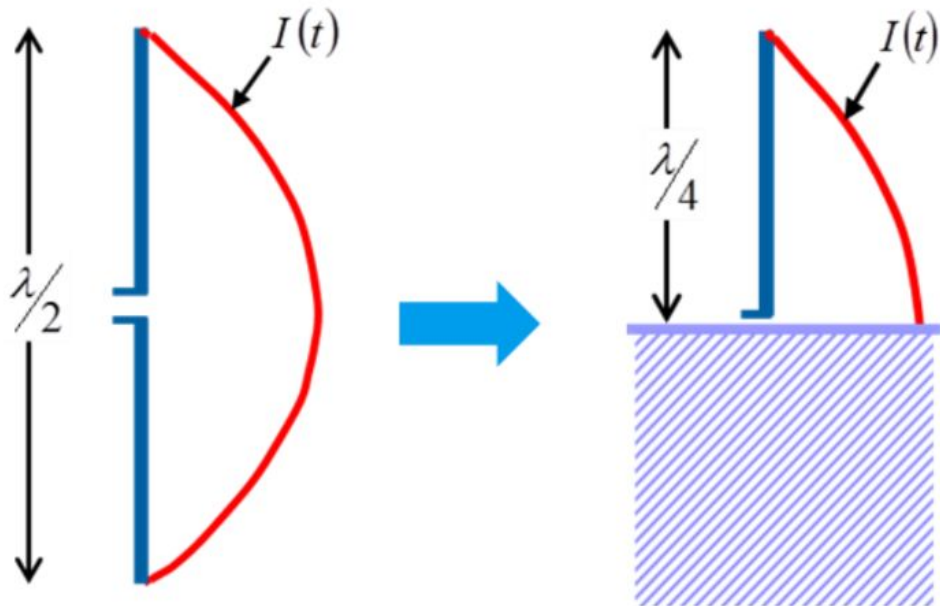


Figure 21: From a dipole to a monopole antenna